# CLAIMS

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. A mobile apparatus comprising:

at least one first sensor for detecting an obstacle in at least the mobility path of said mobile apparatus and providing first data,

at least one second sensor for determining the stability of said mobile apparatus and providing second data,

at least one active joint, and

an algorithm for integrating perception in accordance with at least one of said first data and said second data with action of said joint in performing a cyclic stride and/or adjustment of said cyclic stride to avoid an obstacle.

2. A mobile apparatus as recited in claim 1 wherein said first sensor is a distal sensor and records visual sensory stimuli using at least one of the methods of optic flow, stereopsis, and depth from elevation.

3. A mobile apparatus as recited in claim 2 wherein said distal sensor is at least one of a camera, a laser range finder, ultrasonic range finder, radar, or at least two stereo cameras.

4. A mobile apparatus as recited in claim 1 additionally comprising at least one 'foot' wherein said at least one second sensor for determining the

stability of the apparatus is located on said 'foot'.

5. A mobile apparatus as recited in claim 4 wherein said second sensor is at least one of a tactile sensor, pressure sensor, or vestibular sensor, or multiple second sensors comprising a combination of tactile, pressure, and/or vestibular sensors can be used.

6. A mobile apparatus as recited in claim 1 wherein said algorithm utilizes:

an autonomous system of limit cycle oscillators that generate the necessary pattern for limb movement,

a pseudo-cerebellum, and

a reflex system that recognizes instability of said mobile apparatus using said at least one first or second sensor for learning what constitutes an obstacle.

7. A mobile apparatus as recited in claim 6 wherein

said first sensor is at least one of a camera, a laser range finder, ultrasonic range finder, microwave, ultrasound, radar, or at least two stereo cameras, and

said second sensor is at least one of a tactile sensor, pressure sensor, or vestibular sensor, or in the event of multiple second sensors, a combination of tactile, pressure, and/or vestibular sensors can be used.

8. A mobile apparatus as recited in claim 7 wherein said autonomous system is a system capable of

generating a periodic gate.

9. A mobile apparatus as recited in claim 7 wherein said system is capable of generating a periodic gate is a CPG.

10. A mobile apparatus as recited in claim 7 wherein the pseudo-cerebellum performs the functions of comparison, adaptive gain, and novelty determination based on visual perceptual elements recognized by said at least one first sensor.

11. A mobile apparatus as recited in claim 10 wherein the pseudo-cerebellum performs the additional function of prediction based on other sensory stimuli and an efference copy.

12. A mobile apparatus as recited in claim 1 wherein said algorithm is located on a compact customized neuromorphic chip.

13. A method for determining gait adjustments in a mobile apparatus thereby allowing said mobile apparatus to bypass an obstacle including;

receiving raw visual data,

determining what data within said raw data set is novel based on predictions,

determining if an obstacle is in the mobility path of said mobile apparatus by associating past patterns recorded by said mobile apparatus with past reflexes of said mobile apparatus using a sensorimotor map,

sending determined information to a central pattern generator (CPG) to calculate and dictate

motor commands and resultant movement of said mobile apparatus,

sending an error signal back to the sensorimotor map in the event that instability is detected by sensors on said mobile apparatus as a result of an obstacle, and

learning to associate visual data with emerging obstacles in response to data acquired by at least one first sensor and at least one second sensor.

14. A method as recited in claim 13 wherein said first sensor is a distal sensor and records visual sensory stimuli using at least one of the methods of optic flow, stereopsis, depth from elevation and is at least one of a camera, a laser range finder, an ultrasonic range finder, radar, microwave, ultrasound, or at least two stereo cameras.

15. A method as recited in claim 13 wherein said second sensor is at least one of a tactile sensor, pressure sensor, or vestibular sensor.

16. A method as recited in claim 13 wherein said raw data includes geometric information only including one or more of the following visual cues:

optic flow,

stereopsis, and

depth from elevation.

17. A method as recited in claim 13 wherein said raw data includes non-geometric information including at least one of the following visual cues indicating the quality of a surface:

surface texture,

surface color,

surface pattern, and

specular reflection,

wherein utility functions for multiple surfaces can be determined from said at least one non-geometric visual cue.

18. A method as recited in claim 17 wherein said raw data further includes geometric information derived from at least one of the following geometric visual cues:

optic flow,

stereopsis, and

depth from elevation.

19. A method as recited in claim 13 wherein said error signal is triggered by at least one non-distal sensor located on a 'foot' of said mobile apparatus, a stumble reflex is engaged.

20. A method as recited in claim 19 wherein

said error signal is triggered when the foot is mobile in the upward direction and engaging said stumble reflex, wherein the stride of the mobile apparatus will be lengthened during the encounter to maneuver past the obstacle, but will learn to shorten the stride to secure foot placement directly before the obstacle and bring the foot to a greater height upon passing an obstacle on a similar future encounter, and

said error signal is triggered when the foot is mobile in the downward direction and engaging said stumble reflex, wherein the stride is prematurely terminated to rest said 'foot' on said obstacle

during the encounter to maneuver past the obstacle, but will learn to lengthen said stride on a similar future encounter with a similar obstacle in order to clear the obstacle fully in one stride.